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**Hazardous Materials Incident Costs:  
Estimating the Costs of the July 27, 1994, Propane Truck Crash in  
White Plains, New York**

**October 2004**

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13. ABSTRACT Significant variations in the reporting of hazardous materials incident costs are illustrated using a case study of the July 27, 1994 crash of a propane tanker truck on Interstate 287 in White Plains, New York. Three cost estimates are presented, based on the Hazardous Materials Incident Report filed by the carrier, reports in the news media, and independent follow-up research and interviews. Overall, the costs of the incident, including product loss, emergency response, medical treatment, property damage, legal settlements, and other costs, totaled about \$17 million.			
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## TABLE OF CONTENTS

EXECUTIVE SUMMARY	1
I. BACKGROUND AND MOTIVATION	2
II. SUMMARY OF THE INCIDENT	3
III. ESTIMATES OF COSTS: THREE CALCULATIONS	5
Hazardous Materials Incident Report .....	5
News Media Accounts .....	6
Volpe Center Research .....	14
Discussion .....	22
Decisions Affecting Costs.....	23
IV. SUMMARY AND CONCLUSIONS	24
Policy Implications .....	25
APPENDIX	26

## EXECUTIVE SUMMARY

Federal regulations require that carriers file a Hazardous Materials Incident Report whenever there is an unintentional release of hazardous materials during transportation. These reports include a section addressing the costs of the incident in five categories: *product loss, carrier damage, public and private property damage, decontamination and cleanup*, and *other*. The reports provide a valuable source of information about hazardous materials incidents and their consequences. However, information on costs is subject to considerable variation and inaccuracy.

This report is the second in a series prepared by the Volpe National Transportation Systems Center on behalf of the Office of Hazardous Materials Safety. It is designed to illustrate this variation in the estimates of the impacts and costs of hazmat incidents, particularly with regard to economic damages. It uses a case study approach, looking at the impacts and costs of one incident in particular to highlight the range of cost estimates that can result from consulting different sources. The specific incident studied is the July 27, 1994, crash of a propane tanker truck on Interstate 287 in White Plains, New York. This crash led to an explosion that caused numerous injuries, one fatality, and extensive damage to the roadway and to nearby private property.

Three separate estimates of the impacts and costs of this incident are presented, based on (1) the carrier's own Hazardous Materials Incident Report, (2) reports from the news media, and (3) independent research conducted by Volpe Center staff. The body of this report describes how these estimates were generated, the sources of variation between them, and decisions that were made that affected costs. The following chart summarizes the cost estimates that emerged from this research:

	<b>Product Loss</b>	<b>Carrier Damage</b>	<b>Property Damage</b>	<b>Decontamination / Cleanup</b>	<b>Other</b>	<b>Total</b>
<b>Hazardous Materials Incident Report</b>	Not reported / \$0	Not reported / \$0	Not reported / \$0	Not reported / \$0	Not reported / \$0	<b>Not reported / \$0</b>
<b>Media Reports</b>	Not available	Not available	\$3.1 million +	Not available	\$14.1 million +	<b>\$17.2 million +</b>
<b>Volpe Research</b>	\$2,749	Not available	\$2.4 million	\$179,000	\$14.4 million +	<b>\$17.0 million +</b>

The report concludes with a summary, a discussion of the similarities, differences, and limitations of the estimates, and a brief discussion of the policy implications of the findings.

## I. BACKGROUND AND MOTIVATION

The transportation of hazardous materials is governed by regulations issued by the US Department of Transportation and administered principally by the Research and Special Programs Administration's Office of Hazardous Materials Safety. Included among these regulations is a general requirement for carriers to file a detailed report whenever there is an unintentional release of hazardous materials during transportation (see 49 CFR 171.15 – 171.16). Immediate telephone notification is also required if the incident meets certain severity criteria.

The Hazardous Materials Incident Report (form F 5800.1, *see Appendix*) includes sections for describing the nature of the shipment, the circumstances of the incident, and the type and quantity of the materials released. Also recorded are the contact details of the carrier, shipper, and other involved parties, as well as information on the consequences of the incident – injuries and hospitalizations, fatalities, property damage, other costs, and environmental contamination. Information from these HMIRs is entered into the Hazardous Materials Information System (HMIS), where it serves as a valuable resource for supporting policy analysis and decision-making.

However, information on the consequences of hazmat incidents, particularly costs, is often subject to wide variation and potential inaccuracy. This report is designed to illustrate this variation in the estimates of the impacts and costs of hazmat incidents, particularly with regard to economic damages. It uses a case study approach, looking at the impacts and costs of one incident in particular to highlight the range of cost estimates that can result from consulting different sources. The incident studied is the July 27, 1994, crash of a propane tanker truck on Interstate 287 in White Plains, New York. Although this crash is by no means “typical” of hazmat incidents as a whole, it is a well-known incident with a wide range of consequences and associated press coverage, and is well suited to show the variability in cost estimates.

Three separate estimates of the impacts and costs of this crash are presented, based on (1) the carrier's own HMIR, (2) reports from the news media, and (3) independent research conducted by Volpe Center staff.

Section II of this report provides the necessary background, with a narrative description of the incident itself drawn from media reports and interviews. Section III presents the three sets of costs estimates, and includes some additional discussion of the variance in estimates and decisions that were made that affected costs. Section IV provides a summary and some potential policy implications.

## II. SUMMARY OF THE INCIDENT

This section summarizes the events of the White Plains crash in order to provide the necessary context for the discussions that follow in Sections III and IV. The information in this section is drawn principally from the investigative report of the National Transportation Safety Board<sup>1</sup>, with some additional details drawn from accounts in the media and direct Volpe Center research. Readers seeking detailed and definitive information on the causes of the crash and potential countermeasures should consult the original NTSB report directly, as that goes beyond the scope of the research presented here.

At about 12:30 a.m. on July 27, 1994, a tractor-cargo tank semi-trailer carrying 9,200 gallons of liquid propane was traveling eastbound on Interstate 287 in White Plains, New York, when it began to veer across the left lane and left shoulder. Traveling at a speed of approximately 58 miles per hour, the truck struck the guardrail and then collided with a supporting column of the Grant Avenue overpass. The driver of the tanker truck was ejected from the vehicle and died of blunt-trauma injuries. (The NTSB later concluded that the driver had fallen asleep at the wheel after being on duty for over 35 hours with only minimal rest periods.)

The force of the collision separated the tractor from the semi-trailer and caused the propane tank to rupture. As the propane leaked out, it quickly changed from a liquid to a gas, forming a vapor cloud that ultimately ignited in a massive fireball with a radius of 400 feet. White Plains fire chief James Bradley described it as “the biggest explosion I’ve ever seen” in his 20 years with the department. The blast sent the tank about 300 feet northward, where it landed on a house, setting it ablaze along with several other houses in the neighborhood.

Police, fire, and ambulance crews from White Plains arrived on the scene within minutes to begin emergency response, initially rescuing the members of one family from the roof of their burning home. The emergency responders set up a command post and two triage areas in the neighborhood. By the time the emergency was called to a close at 5:45 a.m., a total of 19 local residents and four firefighters had been injured by the fires. Sixteen of the residents suffered injuries serious enough to warrant hospitalization, and some were in the hospital for weeks.

On I-287 itself, the crash and ensuing fire destroyed the eastbound and westbound median guardrails, scorched the pavement, and sheared off the west bridge column, causing the overpass to sag. Three other local roads, Clinton Street, Central Westchester Parkway, and Grant Avenue, were also damaged. I-287 remained closed in both directions from Exit 6 to Exit 8 for 23 hours after the crash, causing two-mile backups on the highway and dumping thousands of extra vehicles onto local streets. During the period of highway closure, workers from the New York State Department of Transportation (NYSDOT) worked to temporarily shore up the damaged overpass with

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<sup>1</sup> National Transportation Safety Board, Highway Accident Report 95/02 (adopted November 14, 1995). Propane Truck Collision with Bridge Column and Fire, White Plains, New York, July 27, 1994.

six steel beams. Several months later, these beams were removed, the damaged portion of the overpass was demolished, and Grant Avenue was converted to a one-way street. In the years since the crash, NYSDOT has been rebuilding I-287 in sections, and the area around the crash site is scheduled to be rebuilt starting in 2006.



### **III. ESTIMATES OF COSTS: THREE CALCULATIONS**

#### **Hazardous Materials Incident Report**

On August 2, 1994 – just six days after the crash – a Hazardous Materials Incident Report (form DOT F 5800.1) was filed by Michael DiGiorgio, the Director of Fleet and Safety Operations at Paraco Gas. It was received at DOT on August 9. A scanned copy of the report is included in the Appendix.

The HMIR stated that the material spilled was approximately 9,200 gallons of liquefied petroleum gas, commonly called propane. In Section VIII of the report, it stated that the front end of the packaging (i.e. the tanker) failed after the forward end was ripped, which was attributed to a vehicle collision, overturn, and separation. The Consequences section of the report noted that the incident led to spillage, fire, explosion, and environmental damage, and that it led to one fatality and 25 injuries requiring hospitalization.

This injury information was later changed – apparently upon receipt at DOT – to report 16 major injuries and nine minor injuries, and the number of fatalities was reduced to zero. It is likely that this change to the fatality figure was based on the HMIR instructions, which state that fatalities should only be included if they result from the hazardous materials release itself. In this case, the driver of the truck (as autopsies would later confirm) died because of severe impact trauma, not due to the propane released or ensuing explosion and fire.

The HMIR indicated in several places that further details on the causes and consequences of the crash were not known at the time of filing. The narrative summary of the events of the incident in Section IX stated that the “sequence of events that led to the incident is still under investigation” and provided no further substantive details. For each of the five cost categories on Line 23, the HMIR provided only “N/A [not available] at this time.” It is instructive to note that when the HMIR information was entered into the HMIS database, this “N/A” was converted to values of \$0 in each category. Thus, while the HMIR’s cost estimates should properly be regarded as “unknown” in each category, a researcher relying solely on the electronic database might assume that the actual monetary costs of the incident were zero (as is often the case for more minor incidents).

Ten years after the fact, it is difficult to tell whether this lack of detail was unavoidable, given the sheer magnitude of the crash and fire and the fact that the HMIR was filed only six days afterward. Volpe Center research did not locate any articles in the news media dated prior to the HMIR filing date of August 2 that provided even a rough estimate of the property damage and other costs associated with the crash.

On the other hand, even at this early date, the carrier arguably should have been able to provide estimates of the product loss and carrier damage since these could be estimated from the company’s own shipping papers and insurance records. Indeed, the HMIR filed

for the March 2004 tanker crash in Bridgeport, Connecticut – also filed just six days afterwards – did manage to provide reasonable estimates for these two categories, as well as for decontamination/cleanup<sup>2</sup>. Paraco Gas did note on Line 11 of the HMIR that the shipping papers were consumed in the fire, though presumably this information could have been obtained from other sources.

A follow-up interview with Michael DiGiorgio, now the Director of Transportation and Safety at Paraco Gas, confirmed that none of this information was available to him during the somewhat chaotic period just after the crash. Thus, he wrote “not available at this time” for all of the cost items.

**Table 1. Incident Costs as Reported by the Carrier**

	<b>Product Loss</b>	<b>Carrier Damage</b>	<b>Property Damage</b>	<b>Decontamination / Cleanup</b>	<b>Other</b>	<b>Total</b>
<b>Hazardous Materials Incident Report</b>	Not reported / \$0	Not reported / \$0	Not reported / \$0	Not reported / \$0	Not reported / \$0	<b>Not reported / \$0</b>

### News Media Accounts

To develop a set of cost estimates based on media reports, Volpe Center staff first performed comprehensive searches for relevant reports using a number of media databases and search engines including Lexis Nexis, Google, New York Times Database and the Journal News archives.

In total, Volpe Center staff examined 32 accounts from nine sources, including local and national newspapers, television news transcripts, and industry journals. Table 2 presents a summary of the articles reviewed. (Article titles were not available for brief news items that appeared without titles, or that were returned by database searches without full title information.)

**Table 2. Media Sources Consulted in Preparing Cost Estimates**

<b>Media Source</b>	<b>Date</b>	<b>Title</b>	<b>Author(s)</b>
Engineering News-Record	August 8, 1994	NA	Staff writer
Journal News	July 27, 1994	Exploding Truck Launches Fireball	Staff writer
Journal News	July 28, 1994	Out of Disaster, New Life Enters World	Staff writer
Journal News	July 28, 1994	Work Crews Reopen Charred Highway	David McKay Wilson, Margie Druss, Marie Cortissoz

<sup>2</sup> See Volpe National Transportation Systems Center. “Hazardous Materials Incident Costs: Estimating the costs of the March 25, 2004, tanker truck crash in Bridgeport, Connecticut.” August 2004.

Journal News	August 4, 1994	Nine Lives, Indeed: Midnight, the Miracle Cat	Staff writer
Journal News	July 27, 1995	One Year Later, Nightmares Linger in Neighborhood	Staff writer
Journal News	November 15, 1995	Feds Blame Driver, Trucking Company for Blast	Staff writer
Journal News	March 12, 1997	Trucking Firm Fined \$1 Million	Staff writer
Journal News	July 27, 2004	10 Years Later, Conditions for Accident Remain on I-287	Caren Halbfinger
Journal News	July 27, 2004	Neighborhood Remembers 10-year Old Accident	Richard Liebson
Journal of Commerce	August 21, 1996	NA	Staff writer
New York Law Journal	August 4, 1994	NA	Staff writer
New York Post	July 28, 1994	'I Thought We'd Just Been Nuked'	Douglas Kennedy, Cathy Burke
New York Times	July 27, 1994	Tanker Crashes in a Fiery Blast in Westchester	James Barron
New York Times	July 27, 1994	Nightmare of a Crawl for Drivers	Raymond Hernandez
New York Times	July 27, 1994	Tanker Truck Blast Leaves homes Afire	Richard Perez-Pena
New York Times	July 28, 1994	Autopsy Finds Driver Was Sober at Time of Blast	Raymond Hernandez
New York Times	July 29, 1994	Tanker Driver on Duty 15 Hours Before Fatal Crash, Officials Say	Jacques Steinberg
New York Times	July 30, 1994	Regulation of Propane Haulers, Long in Dispute, Is Not Strict Enough, Critics Say	James C. McKinley Jr.
New York Times	August 7, 1994	Expecting the Unexpected: The I-287 Blast	Elsa Brenner
New York Times	August 26, 1994	After Inferno, a White Plains Neighborhood Battles Back	Raymond Hernandez
New York Times	October 2, 1994	Recovery and Lawsuits after Explosion	Elsa Brenner
New York Times	November 14, 1995	Saying Driver Faked Log Entries, U.S. Faults Trucking Firm in Fatal Crash	Matthew L. Wald
New York Times	November 19, 1995	The Costs of Sleeping on the Job	Matthew L. Wald

New York Times	June 15, 1997	I-287 Victims	Staff writer
New York Times	July 20, 1997	Settlement in Blast	Staff writer
Traffic World	April 7, 1997	NA	Staff writer
Transport Topics	August 8, 1994	N.Y. Tanker Accident Draws Federal Investigators	Staff writer
Transport Topics	January 6, 1997	Propane Carrier Admits Falsifying Driver Duty Logs	Thomas M. Strah
WABC-TV New York	July 29, 1994: 6a.m. EST	Eyewitness News	Harry Marin, Mary Anne Wright (Anchors)
WABC-TV New York	August 3, 1994: 5p.m. EST	Eyewitness News	Greg Hurst, Roz Abrams (Anchors)
WNBC-TV New York	July 28, 1994: 5 p.m. EST	Live at Five	Sue Simmons, Matt Lauer, Chuck Scarborough (Anchors)

Volpe Center staff reviewed and analyzed each article, making comparisons across accounts and organizing the quantitative cost elements into the five categories used by the HMIR: *product loss, carrier damage, property damage, decontamination and cleanup*, and *other*. Of course, due to the nature of the reporting, listed costs did not always fit neatly into the HMIR categories; media accounts also often presented costs such as travel delays and assistance to fire victims in purely qualitative terms. In this section, the final total includes only costs that were presented in dollar terms in the media accounts, though the narrative does discuss in as detailed a way as possible all costs that were mentioned.

### *23a – Product Loss*

Of the 32 media accounts, seven made direct mention of the amount of propane gas the tanker truck was hauling on the day of the crash. All seven stated that 9,200 gallons of propane was lost in the ensuing explosion. However, these articles only discussed the quantity and type (liquid) of the released propane, not its dollar value.

### *23b – Carrier Damage*

Most media accounts included very little information on damage to the vehicle itself, and none presented a figure for the monetary value of that damage. Among the articles that did provide qualitative information on the carrier damage, the basic message conveyed was that the truck was destroyed beyond any hope of recovery. One witness, for example, was quoted as saying, “There’s hardly anything left of that truck.”<sup>3</sup>

Other reported information about the truck included the fact that it was a 1991 Freight Tanker and that the propane tank had separated from the tractor, either because of the

<sup>3</sup> Perez-Pena, Richard, New York Times, July 27, 1994.

collision with the overpass support or the ensuing explosion. One article noted that Ryder Inc. owned the truck-trailer, while Paraco owned the gas, the tank and the tractor.<sup>4</sup>

### *23c – Public/Private Property Damage*

The majority of media accounts described, in one way or another, the damage to private homes and public roadways caused by the crash. In particular, most media accounts reported that part of the support for the Grant Avenue overpass was sheared when the truck collided with it; most also mentioned that several homes were set ablaze by the burning propane gas. With respect to private dwellings, the consensus of the accounts was that many homes were destroyed or significantly damaged in the blaze. Two accounts, both published by the Journal News but 10 years apart, remarked that five homes were destroyed in total, and 17 others were significantly damaged.<sup>5</sup> This was partially confirmed by a New York Times article, which noted that three houses were destroyed, as well as two small apartment buildings.<sup>6</sup> The remaining articles that mentioned damages were much more vague, especially concerning the number of homes damaged. Reports of damaged homes varied from as little as “several” or “at least five” to as much as “20 or more.” In no account was there ever a mention of the value (market value, insured value, assessed taxable value, or otherwise) of a particular home.

A small subset of media accounts provided in-depth examples of specific damage to private property – charred grass and lawns, blackened shingles covering broken windows, piles of burnt personal household goods strewn on the lawn, a shrapnel-struck shed. Undoubtedly, the personal property damage was extensive, but again these media reports presented this in very personal, qualitative terms rather than in monetary terms.

A few accounts mentioned damages to other public roadways and utilities, including charred pavement, bent and broken guardrails, and downed power lines. Again, no specific cost estimates were provided. Two media accounts stated that the New York State Department of Transportation (NYSDOT) would take two months to make necessary repairs to the damaged section of highway and overpass; again, no specific cost figures or information was provided.

Of the 32 media stories, only three mentioned specific figures related to property damages. Engineering News quoted a NYSDOT Region 8 engineer, Tom Mannix, who estimated that repairing the damaged bridge would cost about \$500,000, while replacing it altogether would cost approximately \$3 million.<sup>7</sup> A New York Times article also quoted a victim who was attempting to settle with his insurance company, as claiming \$100,000 in damages to household possessions.<sup>8</sup> Finally, the Journal News reported that

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<sup>4</sup> Hernandez, Raymond, New York Times, August 26, 1994. In fact, according to NTSB, Ryder owned the tractor, while Paraco owned the trailer.

<sup>5</sup> Journal News, Work Crews Reopen Charred Highway, July 28, 1994. Halbfinger, Caren, Journal News, July 27, 2004.

<sup>6</sup> Wald, Matthew, Journal News, November 14, 1995.

<sup>7</sup> Engineering News, August 8, 1994.

<sup>8</sup> Hernandez, Raymond, New York Times, August 26, 1994.

the NYSDOT would start area reconstruction and replacement on the crash site as part of a \$10 million project.<sup>9</sup> The article did not mention how much (if any) of that amount was a consequence of the crash, so this last figure is excluded from the total cost estimate in this section.

All in all, the media reports painted a vivid picture of the extensive property damage caused by the crash, but the only specific monetary damages mentioned were for \$100,000 in damaged household goods, plus either \$500,000 for overpass repairs or \$3 million for a complete replacement of the damaged overpass. Even taking the higher figure as a more complete estimate of the actual cost of the overpass damage, this yields a total of only \$3.1 million as the media-reported figure for property damage. At the same time, given the number of houses damaged and destroyed, readers would have been able to discern that the true figure for private property damage was likely much higher.

### *23d – Decontamination/Cleanup*

The media reported that a task force was assembled soon after the explosion to control the blaze, initiate rescue efforts, and clean up debris as quickly as possible in order to re-open the road. Various reports noted that officials closed all six lanes of I-287 to traffic around 1a.m. The New York Times reported that workers spent time cleaning up fallen tree limbs and disposing of burnt personal items. In addition, a bulldozer was called in to pick up what was left of one of the homes that was destroyed. The westbound side of I-287 was re-opened to traffic by around 9 p.m., and the eastbound lane side 11:30 p.m.<sup>10</sup> Thus, all lanes of traffic were re-opened within 24 hours of the crash, implying that the bulk of roadway-related cleanup had been accomplished by that point.

Media reports noted that cleanup efforts at local residences took much longer. Nearly a month after the crash, the New York Times quoted a Grant Avenue resident as saying, “It would be nice if they could get the rubble cleared out. That way, people wouldn’t be going through it, and we wouldn’t have to look at it.”<sup>11</sup>

Aside from this qualitative and anecdotal information, few of the media articles discussed cleanup costs, and none provided specific figures.

### *23e – Other*

Due to the overwhelming number of impacts related to this crash, the Other category contains the broadest and largest costs. For the purposes of this report, these miscellaneous costs and events have been split into a number of categories: emergency response, temporary housing and donations, effects on family, emergency medical and legal, physical and psychological pain and suffering, and traffic delays.

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<sup>9</sup> Halbfinger, Caren, Journal News, July 27, 2004.

<sup>10</sup> Barron, James, New York Times, July 27, 1994.

<sup>11</sup> Hernandez, Raymond, New York Times, August 26, 1994.

## Emergency Response

The city of White Plains incurred about \$20,000 in overtime costs for emergency response.<sup>12</sup> This was mostly due to the emergency response team that needed to be assembled at such short notice, at such an unusual time of day. According to one article, a police captain requested that officers who typically worked the 8 a.m. to 4 p.m. shift come in 7 hours earlier to assist firefighters and the rescue effort, which accounts for at least part of the overtime cost. In addition to that, the article reported that five fire engines, three trucks and a score of ambulances from various neighboring cities responded to the scene. Further, the article quoted the fire chief as stating that there were 150 firefighters on the scene. Edward Nullet, the Director of Disaster and Emergency Services of Westchester County, coordinated all rescue efforts, cleanup and firefighting efforts. His agency set up a temporary command post in White Plains and his temporary staff included six phone-workers.<sup>13</sup> Other articles made little mention of emergency response, other than that it occurred.

## Temporary Housing and Donations

Several articles noted that the Red Cross helped relocate a large number of families to temporary dwellings after the crash. There were inconsistencies among the various accounts as to the number of people relocated. One New York Times article noted that, in total, the Red Cross relocated about 50 people who had lived in five different homes that were “mostly destroyed.”<sup>14</sup> Another account stated that eight families were relocated to homes provided by the Red Cross, while another nine families moved in with friends or relatives<sup>15</sup>; another New York Times article said that three families were helped in finding temporary lodgings, while a fourth was transported to a relative’s home. In addition to coordinating shelter, the Red Cross also served doughnuts and coffee in the hours after the crash to comfort the victims.

For at least one family made homeless by the fire, the cost of temporary housing (an apartment) was paid by the city of White Plain, though the amount paid by the city was not mentioned. Media accounts did note that funds were collected from various sources in order to help with the relief effort for those families left homeless. Specifically, \$50,000 was collected on behalf of the Housing Disaster Relief Fund, \$22,000 was collected from private donors, and the Red Cross provided \$36,000 in order to help aid temporary housing efforts. Other non-monetary donations addressed injured peoples’ shopping, transportation, and mental health needs.<sup>16</sup>

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<sup>12</sup> Hernandez, Raymond, New York Times, August 26, 1994.

<sup>13</sup> Brenner, Elsa, New York Times, August 7, 1994.

<sup>14</sup> Wald, Matthew, Journal News, November 14, 1995.

<sup>15</sup> Hernandez, Raymond, New York Times, August 26, 1994.

<sup>16</sup> Brenner, Elsa, New York Times, October 2, 1994.

## Effects on Family

It was reported that a number of family members spent time caring for their grieving and injured relatives. For example, the Espinals (the family that was arguably the most seriously affected by the incident) relied on relatives in the New York area to cook and care for them during the aftermath of the crash. The reviewed articles made no mention of the quantifiable costs of this assistance. However, one article noted that Mr. Espinal's sister left her factory job in Long Island in order to care for her injured family,<sup>17</sup> which implies significant foregone wages.

## Emergency Medical and Legal

With a few exceptions, media accounts consistently reported that the crash caused 23 non-fatal injuries and one death, the driver of the tanker truck. Of those media reports that reported injuries, only two failed to report the correct number. However, there were many discrepancies about the number and names of people being treated at each of three local hospitals.

As mentioned above, the Espinal family was perhaps the most severely injured in the fire. Ana Espinal suffered serious burns over much of her body. She was also 30 weeks pregnant at the time of the crash; her son was delivered by emergency Caesarean section about one week after the crash to reduce the risks to herself and her child. At least one media report noted that her infant suffered brain damage.<sup>18</sup> Her husband, Leo Espinal, was also badly burned, and one of their children suffered nerve and muscle damage in one leg.

Despite the in-depth reporting of these injuries and medical complications, none of the articles reviewed provided any specific cost figures for the victims' lost wages, emergency hospital costs, or associated legal costs.

## Physical and Psychological Pain and Suffering

It was evident from media accounts that the psychological factors associated with the White Plains incident may in fact have been the most costly of all. As an example, the experience was so traumatic for the Espinal family that they ended up leaving New York, moving back to the Dominican Republic after receiving two years of therapy to deal with what occurred in 1994. (The family ended up returning to White Plains in 2002.) Similarly, Jose Rua, whose house was destroyed in the blaze, was so consumed with anxiety that he was unable to cope. He suffered from depression, high blood pressure and insomnia. His wife meanwhile could not resume her work as a childcare specialist. Other residents suffered flashbacks or were reported to have lost the ability to concentrate.<sup>19</sup> Some later reports discovered that a few of the victims were still having trouble sleeping well after the crash, and in fact, felt unsafe living in the area.

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<sup>17</sup> Brenner, Elsa, New York Times, October 2, 1994.

<sup>18</sup> Wald, Matthew, New York Times, November 14, 1995.

<sup>19</sup> Journal News, One Year Later, Nightmares Linger in Neighborhood, July 27, 1995.



A majority of the media accounts noted the psychological damage incurred by victims of the crash. One media report found that the Red Cross had set up a special task force to aid in victims suffering from Post Traumatic Stress Disorder.<sup>20</sup> One may only judge the total psychological toll from qualitative testimony given by the victims themselves. In numerous accounts, victims claimed it was an event they would never forget, and that it caused their hopes and dreams to be shattered.

In media reports, the largest tangible costs associated with the White Plains crash were the legal settlements obtained, and these mostly related to the long-term pain and suffering incurred by the victims. A number of media accounts discussed the then-pending lawsuits brought by various families. For example, the Espinal family, whose home was destroyed in the crash, brought the largest reported lawsuit. The original suit brought against the truck driver's estate and Ryder Inc., according to reports, was for \$1.3 billion. The *Journal News* recently reported that the suit was finally settled out of court for more than \$10 million.<sup>21</sup> The *New York Times* further reported that Paraco Gas and Ryder Inc. were forced to pay a total of \$2.25 million, through various judgments and settlements, to about 15 other people affected by the crash. The report also mentioned that 12 other cases settled out of court for an undisclosed amount.<sup>22</sup>

Thus, reported legal judgments and settlements totaled at least \$12.25 million, plus the cases that were settled for undisclosed amounts. One recent (July 2004) article in the *Journal News* appeared to provide some additional detail on these undisclosed settlements, when it wrote that the total cost of the crash, including settlements, was "more than \$14 million." In a follow-up conversation, the journalist, Caren Halbfinger, clarified that the \$14 million figure actually referred to legal settlements *only*, so this aggregate figure will be used as the overall media estimate of settlement costs.

### Traffic and Congestion

Both directions of I-287 were closed for much of the day following the crash, and this was reported in numerous media accounts. The costs to local businesses and commuters during that timeframe were largely unknown and intangible. They were nevertheless likely to have been significant. This was at least anecdotally supported, as a number of reports quoted business drivers and commuters complaining about the enormous traffic delays. One United Parcel Service shipper was late on her deliveries due to the congestion caused by the crash; in one hour's time, she claimed to have driven only 3 miles. Displaced rush-hour traffic also flowed onto minor streets such as Broadway. Broadway's traffic volume rose from 1,800 vehicles per hour to 3,000 vehicles per hour.<sup>23</sup>

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<sup>20</sup> Hernandez, Raymond, *New York Times*, August 26, 1994.

<sup>21</sup> Halbfinger, Caren, *Journal News*, July 27, 2004.

<sup>22</sup> *New York Times*, *Settlement in Blast*, July 20, 1997.

<sup>23</sup> Hernandez, Raymond, *Nightmare of a Crawl for Drivers*, July 27, 1994.

Overall, the media estimates of Other costs include the \$20,000 for emergency response, a total of \$108,000 in private donations and humanitarian assistance for victims, and \$14 million (or more) in legal settlements for victims. This total of \$14.1 million, along with the estimates from the other categories, is included in the summary chart below.

**Table 3. Media Estimates of Incident Costs**

	<b>Product Loss</b>	<b>Carrier Damage</b>	<b>Property Damage</b>	<b>Decontamination / Cleanup</b>	<b>Other</b>	<b>Total</b>
<b>Media Reports</b>	Not available	Not available	\$3.1 million +	Not available	\$14.1 million +	<b>\$17.2 million +</b>

### **Volpe Center Research**

This third set of cost estimates was gathered from direct research by Volpe Center staff, who conducted interviews with representatives from the carrier, state DOT, emergency responders, and other parties, as listed in Table 4. The information from these interviews was combined with other available data to confirm and refine the cost estimates from the media reports, and to identify decisions made that affected the overall costs.

**Table 4. Interviewees for Volpe Center Research**

<b>Interviewee</b>	<b>Organization</b>
Lucille Fontana, Attorney	Clark, Gagliardi & Miller Legal Firm
George Santana and Nicholas Choubah, Region 8 Structure Engineers	New York State Department of Transportation
Robert Lenseth, CEO	Red Cross, Westchester County
Eliot Schuman, Attorney	Schuman, Sall & Geist Legal Firm
David Worby, Attorney	Worby, Abele & Aceste Legal Firm (formerly)
Michael DiGiorgio, Director of Transportation Safety	Paraco Gas Corporation
Stuart Betheil, Director	Red Cross, Westchester Office of Emergency Services
Richard Lyman, Fire Chief	White Plains Dept. of Public Safety
John Jackson, Deputy Commissioner	Westchester County Dept. of Emergency Services

Due to limited time and resources, it was not possible to conduct a full-scale investigative operation, particularly since the crash occurred more than 10 years ago and many records are no longer available. The research presented here necessarily relies on publicly available information and on the informed estimates of the affected parties. Nonetheless, by gathering information from multiple sources and by anchoring estimates in external data, this section should provide reasonably reliable estimates of the costs of the incident. One limitation was that, due to the time lags and complexity of the incident, it was not always possible to determine whether certain consequences and costs were specifically

attributable to the *hazardous materials* involved (as the HMIR guidance specifies) or to other aspects of the incident. Where it was possible to make this distinction, this is noted in the report; otherwise, cost information is for the incident as a whole. As the details of this section will show, this does not create a large difference, as the vast majority of costs were related to the subsequent fire and explosion.

### *23a – Product Loss*

The NTSB report stated that 9,200 gallons of propane gas were lost, which was consistent with the majority of media accounts. Because this was a non-retail shipment, the value of the lost propane is equal to the number of gallons multiplied by the approximate wholesale price prevailing at the time.

The U.S. Energy Information Administration reports time-series data on propane prices, though the most comprehensive information is available for the winter months only. According to the USEIA, the spot price for propane on July 27, 1994, was 29.88 cents per gallon, and the average refiner/resale price of consumer-grade propane in July 1994 was 29.80 cents per gallon. Applying the spot price (which generally represents the same-day delivery market price for a commodity) yields a total value of \$2,749 in product losses. This figure is only slightly different if the other price is applied.

### *23b – Carrier Damage*

As described earlier, media reports noted that the tanker truck sustained very severe damage, though few specifics were provided. The NTSB report did have additional details about the nature of the combination vehicle. Specifically, it said that the tractor was a 1991 Freightliner 3-axle chassis with a diesel engine, nine-speed manual transmission with power steering and S-cam air brakes. The tractor was owned by Ryder Inc. and leased to Paraco Gas. The cargo tank was DOT specification MC-331, constructed by Anderson Co., with a water capacity of 11,500 gallons. JMR Enterprises, a subsidiary of Paraco, owned the trailer.

According to the NTSB report, the fire destroyed the tires on the tractor and trailer along with the tractor's brake system. The steering system was severely burned, though it was still technically intact, as was the drive shaft. The report did not mention whether or not any part of the tractor was salvaged. The tank itself was destroyed, having been sheared in the crash and blown hundreds of feet into the air by the ensuing explosion. Neither the NTSB report nor Paraco Gas representatives were able to offer information on the dollar value of the damage to the vehicle.

### *23c – Public/Private Property Damage*

The NTSB report indicated that damage to residences, parked cars, and other personal property in the affected neighborhood of White Plains totaled roughly \$1.7 million. This total may not include damage to utility lines or personal property insurance claims filed after the date of the report, but it appears to be the most comprehensive estimate available for damage to private property.

Damage to public property consisted principally of damage to I-287, the Grant Avenue overpass, and local roadways. George Santana, engineer for NYSDOT Region 8, said that six temporary steel supports were installed after the crash to shore up the overpass. The cost of this temporary repair was approximately \$75,000.

Several months afterward, these temporary supports were removed. Rather than install more permanent supports or re-build the overpass, however, NYSDOT decided to demolish the damaged portion and convert the road to one-way traffic. This change to one-way operation was confirmed by the NTSB report. According to NYSDOT engineers, the total cost of transforming Grant Avenue into a one-way street (including demolition, utility restoration, re-signing, striping the roadway, and cleanup) was \$601,491. This figure is substantially higher than the NTSB report's earlier estimate of future overpass repair costs, but it will be used here because it was drawn directly from the actual NYSDOT project records.

According to Mr. Santana, NYSDOT had plans to rebuild I-287 in the White Plains area – including complete reconstruction of the overpasses – for some time before the crash. At present, NYSDOT plans to begin reconstruction of this section of I-287, including the area where the crash occurred, some time in 2006. Santana estimated that the total cost of the reconstruction would be approximately \$110 million, but also stated that the overwhelming majority of the work will be outside the Grant Avenue area, and that none of the repairs were specifically necessitated by the crash. For these reasons, the \$110 million figure is not included in the final computation of crash-related costs.

Two notable changes were made to the original reconstruction plan as a result of the crash. First, instead of installing a 42-inch median barrier,<sup>24</sup> the NYSDOT now plans to incorporate a 92-inch barrier at the Grant Avenue overpass. NYSDOT's Santana estimated that the additional construction cost of this change would be about \$48,500. Second, instead of using pier beams (bents) to support the bridge, a solid wall will be constructed so the entire pier structure itself will be solid concrete. This change will be incorporated for all overpass piers associated with the project, with the hopes that this design will reduce the shearing and damage caused by vehicle impacts. While these changes could be considered an indirect result of the crash, they are again not included in the final total, because they reflect the costs of particular policy decisions about roadway design standards rather than direct costs of the crash itself.

The best available estimate of property damage thus includes the \$1.7 million in private property damage, \$75,000 for temporary roadway repairs, and \$601,491 in medium-term overpass remediation, for a total of nearly \$2.4 million.

### *23d – Decontamination/Cleanup*

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<sup>24</sup> The NTSB reports that the median barrier was initially constructed to be 27 inches high. At the time of the incident, this was connected to a 32-inch concrete guardrail directly adjacent to the pier. The standard since the crash has been 42-inch barriers.

None of the sources and interviewees consulted – including the carrier, Paraco Gas – had any relevant information on decontamination and cleanup costs.

The NTSB report stated that the cost of cleanup *plus* the cost of the temporary bridge supports totaled \$254,000. Since, as mentioned above, the cost of temporary bridge supports was about \$75,000, one could infer – if indeed both of those figures were accurate – that the clean-up costs themselves came to about \$179,000. The report did not specify what was included as “cleanup” in its reckoning, for example whether it referred to environmental mitigation and/or simple clean-up of debris. This rough (and conjectural) estimate appears to be the only available information on this category of costs.

### *23e – Other*

#### Emergency Response

The NTSB reported that the total cost of emergency response, as estimated by the White Plains Fire Department, was more than \$100,000. Volpe staff contacted Fire Chief Richard Lyman of the White Plain Department of Public Safety, which coordinates the city’s fire and police departments to obtain additional detail on the nature and magnitude of the costs incurred. His office reported the following breakdown of emergency response costs. (These cost figures were collected from city agencies by the White Plains Department of Finance in November 1994, with the expectation of recouping the costs from an insurance claim and/or settlement with Paraco Gas and Ryder.)

White Plains Police and Fire Department (labor overtime)	\$ 20,440
Police mobile command post (communications)	\$ 570
Public Works (labor overtime)	\$ 1,006
Public Works (related equipment expense)	\$ 710
Building personnel (labor overtime)	\$ 153
Building crane rental (related equipment expense)	\$ 5,395
Planning personnel (labor overtime)	\$ 10,321
<b>TOTAL</b>	<b>\$ 38,596</b>

As shown above, total direct costs to the City of White Plains were \$38,596. Chief Lyman explained that the difference between this figure and the \$100,000 estimate provided to the NTSB was due to two factors. First, the larger figure included operating and equipment costs that likely would have been incurred by the city regardless of the crash, and for which no reimbursement was sought. Second, the \$38,596 figure is for the City of White Plains alone and does not include the costs incurred by assisting agencies from neighboring communities. Chief Lyman did not have those costs available, but the Journal News reported that five neighboring fire departments assisted in the response: Greenburgh, North White Plains, Hartsdale, West Harrison and New Rochelle.

Thus while the \$100,000 figure is less precise and may overstate the total costs, the \$38,596 figure is clearly incomplete since White Plains was not the only municipality to incur response costs. By comparison, the emergency response costs for the March 2004 crash of a heating oil tanker truck in Connecticut were around \$900,000 (plus an

additional \$500,000 for ongoing speed enforcement by police). As such, it seems likely that the \$100,000 figure is the closer estimate of total emergency response costs.

### Temporary Housing and Donations

Numerous entities, including the Red Cross, Salvation Army, City of White Plains, and local religious and charitable groups, provided support to families affected by incident. Of these, only the Red Cross was able to provide detailed figures on costs incurred. Stuart Bethel, who was a Red Cross volunteer responder at the crash scene, provided the following cost breakdown:

Household Furnishings	\$ 10,200
Rent and security deposit (temporary housing)	\$ 9,490
Emergency Shelter	\$ 8,172
Clothing	\$ 4,881
On-site food (doughnuts and coffee)	\$ 2,366
Medical Supplies	\$ 1,020
Transportation	\$ 104
Mass Care	\$ 50
<b>TOTAL</b>	<b>\$ 36,283</b>

The above services were made available to 18 affected families, including 48 adults and 15 children. The Red Cross provided mass care and food on-scene for the victims and emergency responders, and provided clothing, medical supplies, and shelter to those in need. While emergency responders secured the crash scene, the Red Cross organized transportation of victims to area hospitals, shelters, and relatives' homes. Temporary housing was also arranged for those who had been forced from their homes by the explosion and fire.

The direct expenses incurred by the Red Cross for these services totaled \$36,283. Of this amount, \$11,435 was raised in a fundraising appeal; the balance was paid from existing Red Cross funds. The Red Cross also provided other housing services that could not be quantified. For example, in addition to providing monetary housing assistance to many families, the Red Cross organized an "Adopt-a-Family" program whereby area families agreed to provide temporary shelter, transportation, and emotional guidance for families affected by the crash.

As mentioned, other organizations provided similar types of financial support, housing, and humanitarian assistance to victims of the incident. Specific figures are not available, but known donations from the Red Cross, the Housing Disaster Relief Fund, and private entities totaled more than \$108,283.

### Emergency Medical Care and Ongoing Treatment

The actual emergency medical costs incurred by victims at local hospitals were not available, which is not surprising given medical privacy concerns and the passage of ten

years. Because of the number of victims and the severity of their injuries, it seemed necessary to include *some* estimate of these costs in this analysis. Volpe Center staff therefore used statistically derived formulas from the Federal Aviation Administration to estimate emergency medical costs based on the number and severity of reported injuries.

Based on the injury information provided by the NTSB report and the FAA formulas on average medical costs for different levels of injury severity, total emergency medical costs for all 23 people injured<sup>25</sup> would have been approximately \$467,209 in 1994 dollars. The actual figure would obviously have been somewhat higher or lower depending on the nature of the medical care provided.

After the initial emergency response phase, the Red Cross also arranged for some of the ongoing medical care and therapy for victims of the incident. According to Mr. Bethel, these costs were “impossible to estimate” because the treatments involved ongoing outpatient services and changed over time. In addition, psychological counseling services were provided to area residents without regard to their degree of physical injury. In fact, the Westchester Red Cross hosted a support group meeting less than a week after the incident, which more than 85 people attended, representing almost 60 affected families.

### Psychological and Physical Pain and Suffering

Apart from their medical bills and other direct financial costs, people affected by the incident incurred very real costs of pain and suffering. These costs are difficult to quantify since they are subjective and not typically represented by market transactions. As one approach to estimating these costs, Volpe Center staff used economic formulas to estimate the “value” (in dollar terms) of the injuries associated with the incident, based on policy guidance from the Office of the Secretary of Transportation (OST). In 1994, OST suggested a “value of life” of \$2.6 million and range of values for non-fatal injuries, depending on their severity.<sup>26</sup>

The NTSB reported that 23 people were injured due to the crash. On the Abbreviated Injury Scale developed by the Association for the Advancement of Automotive Medicine, 13 of these people sustained minor injuries, four sustained moderate injuries, four sustained serious injuries, and two sustained critical injuries. In addition, the NTSB report confirmed that the truck driver was killed but that the death was due to trauma sustained during the crash itself, rather than due to the ensuing explosion and fire. Given these facts, the following injury and fatality costs have been computed:

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<sup>25</sup> This excludes any emergency medical costs for the driver, who was killed in the crash, because it was determined that his death was due to crash-related trauma rather than the hazardous materials released.

<sup>26</sup> Office of the Secretary of Transportation, “Treatment of Value of Life and Injuries in Preparing Economic Evaluations,” 1993 and revisions.

**Table 5. Economic Valuation of Injury and Loss of Life**

Severity of Injury	Fraction of Life Value	Life Value	Number of Persons	Total Value
AIS-1 Minor	.0020	\$2.6 million	13	\$67,600
AIS-2 Moderate	.0155	\$2.6 million	4	\$161,200
AIS-3 Serious	.0575	\$2.6 million	4	\$598,000
AIS-4 Severe	.1875	\$2.6 million	0	\$0
AIS-5 Critical	.7625	\$2.6 million	2	\$3,965,000
AIS-6 Unsurvivable	1.000	\$2.6 million	0	\$0
TOTAL				\$4,791,800

Sources: OST Guidance<sup>27</sup>, NTSB Report<sup>28</sup>, and Volpe Center calculations

Using this methodology, the total cost in terms of the victims’ long-run loss of quality and quantity of life was about \$4.8 million. An alternative methodology – and one that is more grounded in actual transactions – is to sum up the legal judgments and settlements that victims received as compensation for their pain and suffering. To that end, Volpe Center staff reviewed media accounts of lawsuits and settlements and conducted follow-up interviews with a number of attorneys who represented the affected White Plains families.

Attorney Eliot Schuman represented the Prak and Ramos families; specifically, the plaintiffs consisted of Clara Prak, her son, her husband Joao Ramos, and Mr. Ramos’s brother. The family members were burned to varying degrees by the blast that engulfed their Grant Avenue apartment complex. Mr. Schuman estimated that the total settlement in their case against Paraco Gas and Ryder Inc. was \$1.5 million, which represented compensation for their personal suffering and injuries.

Living in the same apartment building on Grant Avenue was the aforementioned Espinal family. Media accounts noted that they received upwards of \$10 million in a settlement for the pain and suffering they sustained because of the blast. Volpe staff contacted one of the family’s attorneys, David Worby (formerly of Worby, Aceste and Abele), who confirmed that the settlement was over \$10 million, though he did not have access to specific records.

As reported in the section on media estimates, an additional \$2.25 million was paid out by Ryder and Paraco to settle lawsuits with about 15 other victims of the explosion and fire. Adding this to the other settlements yields a total of \$13.75 million in pain and suffering-related legal settlements. This total jibes with Mr. Worby’s recollection, which was that the total of all settlements in these cases amounted to between \$13 and \$14 million.

<sup>27</sup> Office of the Secretary of Transportation, “Treatment of Value of Life and Injuries in Preparing Economic Evaluations,” 1993 and revisions.

<sup>28</sup> National Transportation Safety Board, Highway Accident Report 95/02 (adopted November 14, 1995). Propane Truck Collision with Bridge Column and Fire, White Plains, New York, July 27, 1994.



This total is roughly triple the \$4.8 million generated using theoretical economics formulas, but since it is based on the actual facts and circumstances of this case – and represents actual transfers of money – it is arguably a more appropriate estimate of this aspect of incident costs. It is this \$13.75 million figure that will be used in the total for this section.

Traffic and Congestion

The NTSB reported that the Average Daily Traffic (ADT) on this section of I-287 was 105,000 vehicles per day; on the day of the crash, 54,132 vehicles crossed the Tappan Zee Bridge eastbound. As noted above, all six lanes of I-287 were closed after the crash – the westbound lanes for about 21 hours, and the eastbound lanes for 23 hours. Most of the more than 100,000 vehicles that typically used that section of I-287 were likely to have been negatively affected by the road closure to various degrees. The associated costs would include the value of delayed deliveries, time spent in congestion or on detours, or the costs of foregoing a trip altogether.

Although these costs are potentially quite significant, no congestion- and delay-related costs are included in the total for this section because of the difficulty in quantifying them. Theoretical models exist in the transportation economics literature for the estimation of the external costs of traffic congestion, but they are not necessarily appropriate here given the limited data available and the complex nature of this crash.

All in all, the quantifiable costs in the Other category include: roughly \$100,000 in emergency response costs, a formula-based estimate of \$467,209 in emergency medical costs, at least \$108,283 in humanitarian and charitable assistance to victims, and \$13.75 million (or more) in pain and suffering-related legal settlements. This yields a total of approximately \$14.4 million (or more) in this category, as shown on the summary table below.

**Table 6. Estimates of Incident Costs Based on Volpe Center Research**

	<b>Product Loss</b>	<b>Carrier Damage</b>	<b>Property Damage</b>	<b>Decontamination / Cleanup</b>	<b>Other</b>	<b>Total</b>
<b>Volpe Research</b>	\$2,749	Not available	\$2.4 million	\$179,000	\$14.4 million +	<b>\$17.0 million +</b>

## Discussion

Table 7 summarizes the three sets of cost estimates developed. As the table and the preceding sections indicate, there is significant variation in the availability and magnitude of cost estimates across sources. It is also important to keep in mind that no estimate of total costs can be considered completely accurate and comprehensive, because estimating costs involves judgment calls about whether and how to quantify certain impacts.

**Table 7. Summary Chart of Cost Estimates**

	<b>Product Loss</b>	<b>Carrier Damage</b>	<b>Property Damage</b>	<b>Decontamination/Cleanup</b>	<b>Other</b>	<b>Total</b>
<b>Hazardous Materials Incident Report</b>	Not reported / \$0	Not reported / \$0	Not reported / \$0	Not reported / \$0	Not reported / \$0	<b>Not reported / \$0</b>
<b>Media Reports</b>	Not available	Not available	\$3.1 million +	Not available	\$14.1 million +	<b>\$17.2 million +</b>
<b>Volpe Research</b>	\$2,749	Not available	\$2.4 million	\$179,000	\$14.4 million +	<b>\$17.0 million +</b>

In this case, the HMIR contained no quantitative information on any of the five categories of costs. Follow-up interviews with the carrier confirmed that this was due to a lack of available information available at the time the report was filed, which was less than one week after the crash. The carrier's representative also stated that it preferred to rely on the subsequent NTSB report to outline some of the costs of the crash.

The news media reports, for their part, were valuable sources of additional information on the consequences of the crash, including: the efforts of first-responders, the effects of resulting road congestion, plans for reconstruction of the highway, and human loss and suffering. Nevertheless, there were some discrepancies across reports and between the reports and subsequent Volpe Center research. Some of these were quite simple – for example, there were discrepancies in the names and number of individuals injured in the incident, as well as the chain of events that occurred immediately after the crash. In addition, the reports did not provide a full range of cost reporting, tending to focus only on certain aspects of the incident and to report consequences without associated dollar figures.

With respect to the Property Damage category, it is worth noting that the similarity between the media estimate and Volpe Center estimate is somewhat misleading. While the overall total values are similar, the underlying items that make up the two estimates

are quite different. Specifically, the media estimate is based largely on an early estimate of roadway damage, while the Volpe Center estimate includes a more updated tally of roadway repair costs as well as the private property damage to neighborhood homes. Similarly, while the two overall estimates for the Other category are quite similar, the media estimate does not include certain items – such as emergency medical costs, emergency response costs, and the costs of temporary housing and other humanitarian assistance – that are represented in the Volpe Center estimate.

There are two other important things to mention regarding the Volpe Center estimate of total costs. First, this estimate does not include any economic value for the life lost in the crash. Although it is common practice in some social science fields to assign a standard dollar value to lives lost (as an admittedly incomplete measure of foregone earnings, emotional distress, and other factors), the exact figure to be used is the subject of some discussion, and in any event, this type of calculation is not part of typical HMIR cost reporting. (If the standard value suggested by OST had been applied, the total costs of the incident would have been \$2.6 million higher.) Second, at least one media report stated that some of the legal cases brought by affected White Plains families were settled out of court for undisclosed amounts. It was not possible to obtain details on the value of these settlements, nor (for obvious reasons) on any out-of-court settlements that may have been kept entirely confidential. As such, the figures for legal settlements presented here should be regarded as akin to lower bound estimates.

### *Decisions Affecting Costs*

The only policy decision with a significant effect on incident-related costs seems to be the decision on how to repair the damage to the Grant Avenue overpass. The options that were initially presented in the press were either to repair the overpass or to replace it altogether. As it turned out, NYSDOT decided instead to demolish the damaged section of the overpass and convert Grant Avenue to one-way movement. This work ultimately cost just over \$600,000. Interestingly, the NTSB had reported that NYSDOT estimated that it would cost \$213,000 to permanently repair the overpass and median, and early media accounts estimated that permanent bridge repair would cost about \$500,000. While it is somewhat counterintuitive that a medium-term fix (the conversion to one-way operation) would cost *more* than a permanent repair, it is not unexpected given the passage of time and increases in construction costs.

#### IV. SUMMARY AND CONCLUSIONS

This report has presented three separate estimates of the impacts and costs of the 1994 incident, based on (1) the carrier's own Hazardous Materials Incident Report, (2) reports from the news media, and (3) independent research conducted by Volpe Center staff. The HMIR provided no quantitative information regarding the costs of the incident, so it could not be used to conduct explicit comparisons of the accuracy of the HMIR figures vis-à-vis those reported in the press or elsewhere.

The media-reported and Volpe Center estimates of total incident-related costs both yielded a total of approximately **\$17 million** in costs. The two estimates had underlying cost elements and figures that were not quite as similar as those two bottom-line figures might suggest. However, with respect to the single biggest category of costs – the compensation paid to White Plains residents injured in the fire and explosion – the media reports were both largely accurate and consistent with the information gathered by the Volpe Center in follow-up research with the plaintiffs' attorneys.

As an earlier report in this series noted<sup>29</sup>, there are several sources of potential inaccuracy and discrepancy in the gathering and reporting of incident cost information, particularly for the carrier itself. Among these are the **reporting deadline**, which limits the time available to gather information; **limited guidance** on what to include as an incident-related cost and the difficulty in determining this for a complex chain of events; and the **organizational complexity** inherent in obtaining cost information from multiple agencies and private entities.

All of these factors also apply, to one degree or another, to the incident analyzed in this report. In this case, the carrier filed less than a week after the crash and all of the cost fields in the report were listed as “not available at this time.” Even with the benefit of additional time, the carrier would have faced difficulty in assembling all of the relevant information from local and state agencies, charities, private property owners, and individuals pursuing legal action. Many of the legal cases were not settled until years afterward, which is important because these settlements made up the largest portion of the costs. As with the 2004 Bridgeport crash analyzed earlier, the carrier would have also faced significant complexities in calculating the portion of highway reconstruction work that was **specifically attributable** to the crash itself, and might have encountered difficulty in generating a fully comprehensive estimate of damages at the same time as it sought to **disclaim legal liability** for certain impacts.

From a methodological point of view, it is important to reiterate that several different methods were used to generate the cost data presented here under the Volpe Center research section. Much of the cost data came directly from interviews or documentation, some of which was complemented or confirmed by parallel reports in the media. Statistical formulas were used instead to estimate emergency medical costs, as no other information was available, and the calculation of clean-up costs relied on deductive

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<sup>29</sup> Volpe National Transportation Systems Center. Op. cit.

reasoning based on other reported information. Certain costs, including carrier damage, could not be calculated at all because of a lack of data or a means of estimation. Finally, some costs were excluded altogether because they were not tangible, not easily quantifiable, and/or not typically part of HMIR reporting; these included the costs of traffic delays and the economic “value” of the loss of life.

Estimates of incident-related costs derived from media reports tend to vary from other calculations because of the fundamentally different way in which journalists approach an issue – that is, with a focus on the information that is of greatest interest to their readership, regardless of its relationship to the HMIR reporting structure. In this case, there was a strong emphasis on the nature of the physical damage, the injuries and psychological trauma suffered by the affected families, and the effects on local traffic. While individual media reports were incomplete and imprecise, the overall cost estimate drawn from a composite of reports was ultimately fairly close to the total generated by direct research, again because of the quality of the information on legal settlements.

### **Policy Implications**

An earlier analysis<sup>30</sup> highlighted several policy implications for the Hazmat Office. Without unnecessarily repeating the details from that report, briefly these were:

- The need to assist the carrier in identifying the lead agency directing incident response,
- The need, particularly after the Other Costs category is removed, for additional guidance on whether and how to include costs that are not specifically mentioned in the HMIR guidance, and
- The need for additional consistency in the way that HMIR filings are converted to HMIS database entries.

Each of these policy implications is also relevant to the present case, and the third point is particularly salient in light of this research on the White Plains incident. In this case, the total cost of the incident was approximately \$17 million, and yet – because the “not available” entries on the report were transformed into zeroes during data processing – a subsequent review of the HMIS database would instead indicate that the incident was free of costs (as, indeed, many smaller incidents are).

Since one of the purposes of the HMIR is to provide accurate data that can be used in research and analysis supporting efforts to direct resources and reduce future crashes, it is essential that the data be accurate. In addition to the new requirement that carriers provide cost updates, the first step in this direction would be a **different coding value for missing or unknown values** rather than a misleading zero. Another improvement would be a set of **consistency checks** that would “flag” for follow-up any database entries with potentially contradictory information – e.g., where the HMIR reports several hospitalizations but no associated costs, or where the report lists fire, explosion, or package failure without including any estimate of product loss or carrier damage.

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<sup>30</sup> Volpe National Transportation Systems Center. Op. cit.

APPENDIX

Hazardous Materials Incident Report as filed by Paraco Gas Corporation:

**DEPARTMENT OF TRANSPORTATION  
HAZARDOUS MATERIALS INCIDENT REPORT** Form Approved OMB No 2137 0039

INSTRUCTIONS Submit this report in duplicate to the Information Systems Manager, Office of Hazardous Materials Transportation, DHM-63, Research and Special Programs Administration, U S Department of Transportation, Washington, D C 20590 If space provided for any item is inadequate, complete that item under Section IX, keying to the entry number being completed Copies of this form, in limited quantities, may be obtained from the Information Systems Manager, Office of Hazardous Materials Transportation Additional copies in this prescribed format may be reproduced and used, if on the same size and kind of paper

*Mode 5*

**J MODE, DATE, AND LOCATION OF INCIDENT**

1 MODE OF TRANSPORTATION  AIR  HIGHWAY  RAIL  WATER  OTHER \_\_\_\_\_

2 DATE AND TIME OF INCIDENT (Use Military Time e.g 8 30am = 0830 noon = 1200 6pm = 1800 midnight = 2400) Date 07.27.94 TIME 12:30 am

3 LOCATION OF INCIDENT (include airport name in ROUTE/STREET if incident occurs at an airport)  
CITY White Plains STATE NEW YORK NY  
COUNTY WESTCHESTER ROUTE/STREET I-287

**II DESCRIPTION OF CARRIER, COMPANY, OR INDIVIDUAL REPORTING**

4 FULL NAME PARACO GAS CORPORATION 5 ADDRESS (Principal place of business)  
63576 2975 WESTCHESTER AVE.  
PURCHASE, NY 10577

6 LIST YOUR OMC MOTOR CARRIER CENSUS NUMBER REPORTING RAILROAD ALPHABETIC CODE MERCHANT VESSEL NAME AND ID NUMBER OR OTHER REPORTING CODE OR NUMBER D.O.T. # 354596

**III SHIPMENT INFORMATION (From Shipping Paper or Packaging)**

7 SHIPPER NAME AND ADDRESS (Principal place of business)  
PARACO GAS  
499 E. JERICHO TURNPIKE  
Smithtown, NY 11787 63570

8 CONSIGNEE NAME AND ADDRESS (Principal place of business)  
PARACO GAS  
499 E JERICHO TURNPIKE  
SMITHTOWN, NY 11787 63570

9 ORIGIN ADDRESS (if different from Shipper address) SAME AS ABOVE

10 DESTINATION ADDRESS (if different from Consignee address) SAME AS ABOVE

11 SHIPPING PAPER/WAYBILL IDENTIFICATION NO Burned in fire

**IV HAZARDOUS MATERIAL(S) SPILLED (NOTE REFERENCE 49 CFR SECTION 172.101)**

12 PROPER SHIPPING NAME LPG 6300 13 CHEMICAL/TRADE NAME Propane C<sub>3</sub>H<sub>8</sub> 14 HAZARD CLASS 2 15 IDENTIFICATION NUMBER (e.g UN 2784 NA 2020) UN1075

Liquid Petroleum Gas

16 IS MATERIAL A HAZARDOUS SUBSTANCE?  YES  NO 17 WAS THE RM MET?  YES  NO

**V CONSEQUENCES OF INCIDENT, DUE TO THE HAZARDOUS MATERIAL**

18 ESTIMATED QUANTITY HAZARDOUS MATERIAL RELEASED (include units of measurement) 9,200 gallons LSA

19 FATALITIES 0 20 HOSPITALIZED INJURIES 25 21 NON HOSPITALIZED INJURIES 9

22 NUMBER OF PEOPLE EVACUATED 0

23 ESTIMATED DOLLAR AMOUNT OF LOSS AND/OR PROPERTY DAMAGE INCLUDING COST OF DECONTAMINATION OR CLEANUP (Round off in dollars)

A PRODUCT LOSS <u>N/A AT this time</u>	B CARRIER DAMAGE <u>0'</u>	C PUBLIC/PRIVATE PROPERTY DAMAGE <u>0'</u>	D DECONTAMINATION/ CLEANUP <u>0'</u>	E OTHER <u>04/0'</u>
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24 CONSEQUENCES ASSOCIATED WITH THE INCIDENT  SPILLAGE  FIRE  EXPLOSION  VAPOR (GAS) DISPERSION  MATERIAL ENTERED WATERWAY/SEWER  ENVIRONMENTAL DAMAGE  NONE  OTHER \_\_\_\_\_

**VI TRANSPORT ENVIRONMENT**

25 INDICATE TYPE(S) OF VEHICLE(S) INVOLVED  TANK CAR  RAIL CAR  TOP/COFC  CARGO TANK  AIRCRAFT  VAN TRUCK/TRAILER  BARGE  FLAT BED TRUCK/TRAILER  SHIP  OTHER \_\_\_\_\_

26 TRANSPORTATION PHASE DURING WHICH INCIDENT OCCURRED OR WAS DISCOVERED  EN ROUTE BETWEEN ORIGIN/DESTINATION  LOADING  UNLOADING  TEMPORARY STORAGE/TERMINAL

27 LAND USE AT INCIDENT SITE  INDUSTRIAL  COMMERCIAL  RESIDENTIAL  AGRICULTURAL  UNDEVELOPED

28 COMMUNITY TYPE AT SITE  URBAN  SUBURBAN 2  RURAL

29 WAS THE SPILL THE RESULT OF A VEHICLE ACCIDENT/DERAILMENT? IF YES AND APPLICABLE ANSWER PARTS A THRU C  YES  NO

A ESTIMATED SPEED (58) mpy B HIGHWAY TYPE  DIVIDED/LIMITED ACCESS 1  UNDIVIDED C TOTAL NUMBER OF LANES  ONE  THREE 3  TWO  FOUR OR MORE

FORM DOT F 5800 1 (Rev 6/89) Supersedes DOT F 5000 1 (10/75) (9/11/75) 130-F THIS FORM MAY BE REPRODUCED

1994080633

PACKAGING INFORMATION. If the package is overpacked (consists of several packages, e.g. glass jars within a fiberboard box), begin with Column A for information on the innermost package

ITEM		A	B	C			
30	TYPE OF PACKAGING INCLUDING INNER RECEPTACLES (e.g. Steel drum, tank car)	ML331 Tank					
31	CAPACITY OR WEIGHT PER UNIT PACKAGE (e.g. 55 gallons, 65 lbs)	11,500 gallons LGA					
32	NUMBER OF PACKAGES OF SAME TYPE WHICH FAILED IN IDENTICAL MANNER	1					
33	NUMBER OF PACKAGES OF SAME TYPE IN SHIPMENT	1		30 CAUSE			
34	PACKAGE SPECIFICATION IDENTIFICATION (e.g. DOT 17E, DOT 105A100, UN 1A1 or none)	UN 1075		100 MIS			
35	ANY OTHER PACKAGING MARKINGS (e.g. STC, 1816-55-88, Y1 4150187)	HAZARD Class 2 18745		N ATTACH			
36	NAME AND ADDRESS, SYMBOL OR REGISTRATION NUMBER OF PACKAGING MANUFACTURER	TRINITY INDUSTRIES / Anderson Co.		N RECOM			
37	SERIAL NUMBER OF CYLINDERS, PORTABLE TANKS, CARGO TANKS, TANK CARS	118412 FLAM GAS					
38	TYPE OF LABELING OR PACKAGING APPLIED	Diamond Decal Aluminum Placards in Header					
39	IF RECONDITIONED OR REQUALIFIED	A REGISTRATION NUMBER OR SYMBOL B DATE OF LAST TEST OR INSPECTION					
40	EXEMPTION/APPROVAL/COMPETENT AUTHORITY NUMBER IF APPLICABLE (e.g. DOT E1012)						
<b>VIII. DESCRIPTION OF PACKAGING FAILURE</b> Check all applicable boxes for the package(s) identified above							
41 ACTION CONTRIBUTING TO PACKAGING FAILURE			42 OBJECT CAUSING FAILURE				
a	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	a	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C
b	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	b	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	c	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	d	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	e	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	f	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C
g	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	g	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	h	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	i	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TRANSPORT VEHICLE COLLISION TRANSPORT VEHICLE OVERTURN OVERLOADING/OVERFILLING LOOSE FITTINGS, VALVES DEFECTIVE FITTINGS, VALVES DROPPED STRUCK/RAMMED IMPROPER LOADING IMPROPER BLOCKING			CORROSION METAL FATIGUE FRICTION/RUBBING FIRE/HEAT FREEZING VENTING VANDALISM INCOMPATIBLE MATERIALS OTHER				
43 HOW PACKAGE(S) FAILED			44 PACKAGE AREA THAT FAILED				
a	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	a	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C
b	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	b	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	c	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	d	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	e	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	f	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	g	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	h	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PUNCTURED CRACKED BURST/INTERNAL PRESSURE RIPPED CRUSHED RUBBED/ABRADED RUPTURED OTHER			END FORWARD END REAR SIDE RIGHT SIDE LEFT TOP BOTTOM CENTER OTHER				
45 WHAT FAILED ON PACKAGE(S)							
a	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	a	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C
b	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	b	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	c	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	d	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	e	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C
f	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	f	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	g	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	h	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
BASIC PACKAGE MATERIAL FITTING/VALVE CLOSURE CHIME WELD/SEAM HOSE/PIPING INNER LINER OTHER							
<b>IX. DESCRIPTION OF EVENTS</b> Describe the sequence of events that led to incident, action taken at time discovered, and action taken to prevent future incidents. Include any recommendations to improve packaging, handling, or transportation of hazardous materials. Photographs and diagrams should be submitted when necessary for clarification. ATTACH A COPY OF THE HAZARDOUS WASTE MANIFEST FOR INCIDENTS INVOLVING HAZARDOUS WASTE. Continue on additional sheets if necessary.							
<p>The sequence of events that led to the incident is still under investigation. The National Transportation Safety Board will prepare a report in approximately 5 to 6 months. The action taken when notified of the accident at approximately 2am was immediate response to the scene.</p> <p>We are in the process of reviewing the accident to determine course of action to prevent a recurrence of a similar accident.</p>							
RECEIVED 91 AUG - 2004 PH 2:55							
46 NAME OF PERSON RESPONSIBLE FOR PREPARING REPORT				47 SIGNATURE			
Michael DiGiorgio							
48 TITLE OF PERSON RESPONSIBLE FOR PREPARING REPORT				49 TELEPHONE NUMBER (Area Code)		50 DATE REPORT SIGNED	
Director of Fleet & Safety Operations				914-664-2369 x230		8-2-94	